The USAF Manufacturing Technology

PROGRAM STATUS REPORT

Air Force Research Laboratory / Materials & Manufacturing Directorate /
Manufacturing Technology Division / Wright-Patterson AFB, Ohio
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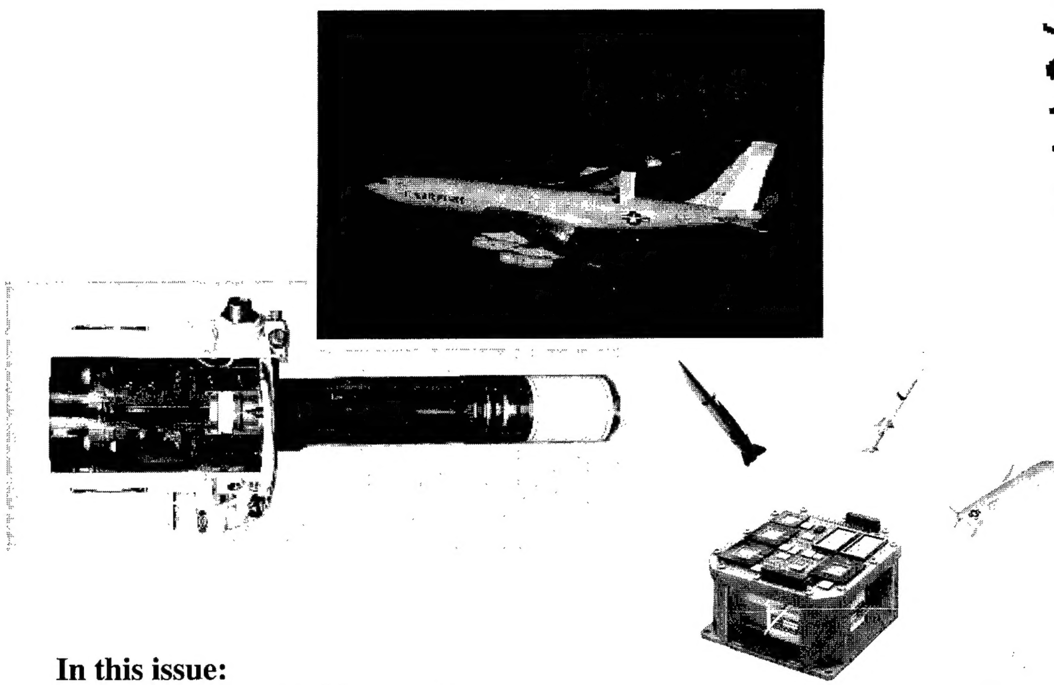
Fall 1998



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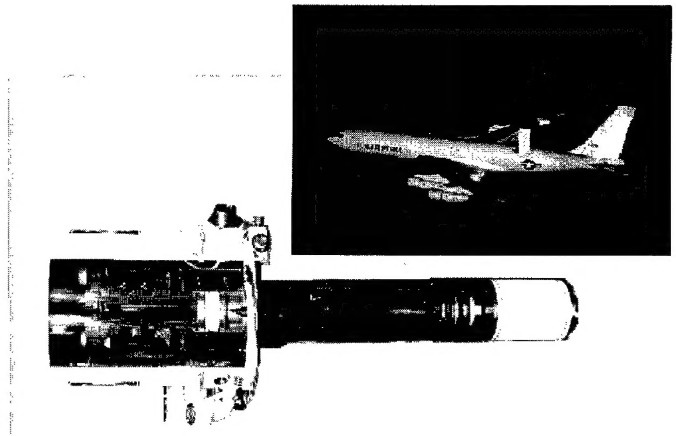
Air Force Research Laboratory | AFRL

Science and Techology for Tomorrow's Aerospace Force

New Salvageable Electron Gun Lowers Repair Costs for AWACS Radar System



The Klystron Power Amplifier used on AWACS aircraft.

A manufacturing technology effort supported by Air Force Research Laboratory's Materials and Manufacturing Directorate, has led to the development of a new electron gun that dramatically lowers the cost of repairing the Airborne Warning and Control System's (AWACS) radar.

Unlike its predecessor, the new electron gun does not need to be replaced every time the radar's KPA (Klystron Power Amplifier) is damaged or destroyed. Replacing existing guns with more efficient models may provide for greater AWACS mission availability, reductions in maintenance downtimes, significantly lower repair and part acquisition costs, and could eventually save the Air Force millions of dollars.

At present, whenever the vacuum integrity of an Airborne Warning and Control System's (AWACS) Klystron Power Amplifier (KPA) is damaged or destroyed, the KPA can be repaired, rebuilt and made serviceable again. In fact, the KPA can be repaired and rebuilt several times if the need is there. Unfortunately, each time the vacuum integrity of the KPA is lost, the electron gun must be removed and scrapped. In short, if the KPA is to be rebuilt, it must have a new electron gun.

The electron gun currently used has an oxide coated cathode, meaning the electron emission surface of the cathode is applied to a substrate. The cathode coating is converted from a mixture of oxides and the conversion occurs at high temperatures during the exhaust/bake out processing of the KPA. This conversion is necessary in order to provide a material that readily emits electrons. Once the conversion has taken place, the oxide emission material is destroyed if it is subjected to any amount of air. The existing electron gun also must use grids to control the electron beam emitted from it. The cathode is coated, then the grids are installed. Once this takes place, the mechanical design of the electron gun is such that these grids cannot be removed without inflicting non-repairable damage to the electron structure. Subsequently, every time the KPA loses its vacuum, the electron gun must be scrapped. The method of attachment of the gun to the high voltage insulator provides a structure that does not permit the gun to be separated from the insulator assembly without causing excessive damage to both. This also breaks the integrity of the vacuum and results in the scrapping of the insulator assembly each time the gun is removed from the KPA.

The objective of this manufacturing technology effort was to address the manufacturing process improvement issues involved for the successful removal of the electron gun from the KPA to allow the gun to be repaired and reused instead of scrapped. Under a contract with Litton Corporation, the project has led to the successful development and testing of a new electron gun that doesn't need to be replaced every time a KPA is damaged or destroyed. The tests showed conclusively that the gun can be removed from the KPA's high voltage insulator assembly and the grids can be removed without causing any additional damage, thus permitting any required repairs and eliminating the need to scrap the gun.

For more information, circle Reader Response Number 1

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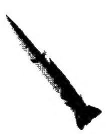
F33615-96-C-5103

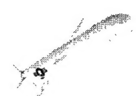
New Manufacturing Processes Improve Guidance and Navigation Systems

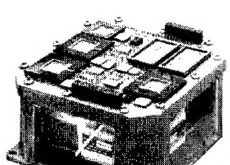
Scientists and engineers at the Air Force Research Laboratory's Materials and Manufacturing Directorate have dramatically improved the manufacturing processes used to build Interferometric Fiber Optic Gyroscopes (IFOG) for tactical missile guidance and aircraft navigation systems.

The program used a teaming approach and variability reduction techniques including design of experiments, process and cost models, statistical process control and process capability measurements as well as automation to reach established program goals.

Missile guidance systems and aircraft navigation systems require highly accurate gyro subsystems in order to ensure targeting accuracy and flight safety. IFOG subsystems offer improved reliability, considerably lower cost and design flexibility over current mechanical and ring laser gyro subsystems. Prior to this program, IFOG component costs were high due to the fact that fabrication processes required extreme accuracy and assembly was labor intensive. Improved manufacturing processes were required to reduce IFOG production costs originally estimated at $6,000 to $7,000 per axis.







Under a contract sponsored by AFRL, Litton Corporation attempted to accelerate the integration of IFOG technologies into tactical missile guidance and aircraft navigation systems. Because much of the IFOG production cost is driven by component suppliers, a teaming approach was required. The Litton team included: EG&G (superluminescent diodes); Photonic Packaging Technologies (laser diodes); Marlow Industries (thermoelectric coolers); 3M Company (optical fibers); Pacific Precision Laboratories (fiber alignment stages); Ipitek (couplers); Ramar Corporation (integrated optic chips); Newport Corporation (power meters); Hewlett Packard and Optelecom (fiber optic gyro coil winders). Litton Corporation is developing bulk fiber winders used to perform the transfer winding of the optical fiber from the manufacturer's spools to quadrapole coilwinder transfer spools. Litton is also developing automated assembly stations for fiber preparation, splicing and rejacketing, and automated packing stations for integrated optics chip wire bonding, pull testing, cover attachments and strain relief application.

At the start of the program, the teams baselined their assembly production operations. Customer input from the Industry Review Board (IRB) and from the Advanced Medium Range Air-to-Air Missile (AMRAAM) JSPO was used to fill out quality function deployment matrices. These were then used to focus the team's efforts. Process macro and micro flows were then used to provide metrics and traceability for the program. In addition, the team used variability reduction techniques including design of experiments, process and cost models, statistical process control and process capability measurements together with automation to obtain program goals. Their results were verified with two builds. The first gyro build took place in July 1996, and all the gyros built exceeded the program goals (30 gyros were built; half operated at 1.3 microns and half operated at 1.5 microns). The second build was completed during November 1997. The long-term objective is to establish the manufacturing processes and supplier base needed to reduce the cost of tactical grade IFOG subsystems by an additional 50 percent.

IFOG technologies offer improved reliability, significant cost reductions and design flexibility over mechanical and ring laser gyro subsystems currently in use. Their efforts could result in a greater than 90 percent reduction in IFOG subsystem costs, better processes and more precise direction for the industry.

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For more information, circle Reader Response Number 2

Defense Production Act Title III Project Furthers Tri-Service Electric Power Initiatives

The Defense Production Act (DPA) Title III Program Office recently announced the award of a five-year, $12 million cost-shared contract to Silicon Power Corporation (SPCO) of Malvern, PA. This effort will expand production capabilities for solid-state devices used as medium and high-power electrical switches for both military and commercial applications.

"These devices, known as Power Semiconductor Switching Devices (PSSDs), are solid-state components that replace current electro-mechanical switches, increasing switching efficiency and power handling capability while reducing acquisition and life-cycle costs," according to Jeff Smith, Title III Program Manager. "PSSDs are essential to the development and deployment of advanced Air Force, Navy, and Army weapon systems. This project will remove a major barrier to producing aircraft, ships, and tanks that use electrical systems to replace hydraulic systems, as well as directed energy weapons, and electro-magnetic launchers."

Philip W. Tydings, Title III PSSD project leader, said, "This will be a team effort, strengthened by the continuing technical assistance provided by scientists and engineers from the Air Force Research Laboratory (AFRL) Propulsion Directorate, Materials and Manufacturing Directorate, Office of Naval Research, and the Army Research Laboratory."

President and CEO of SPCO, Dr. Harshad Mehta, stated, "I look forward to partnering with Title III to establish a family of high quality devices to meet demanding military and commercial electrical power switching, control, and conditioning applications."

Title III is a unique program in the Department of Defense (DoD) arsenal to maintain technology leadership. Its mission is to provide industry with financial incentives to create, expand, and maintain assured, affordable, and commercially viable production capacities and capabilities for items essential for national defense.

The Air Force is the Executive Agent for the Title III Program by authority of the Deputy Under Secretary of Defense for Commercial and International Programs. The DPA Title III Program Office, located within the AFRL Materials and Manufacturing Directorate at Wright-Patterson AFB, Ohio, provides program management.

SPCO is a leading US manufacturer of high power semiconductors with the power ratings required by the most demanding industrial, utility, transportation, and military applications. They are the oldest, continuously operating solid-state device engineering and manufacturing company in the world, dating back to the late 1920's and copper oxide rectifiers. The company was an operation of the General Electric Company until 1994, when it was spun off as SPCO.

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For more information, circle Reader Response Number 3

New Computer Software Program Streamlines Design Process for Sheet Metal Tools

Technology transfer from the Air Force Research Laboratory (AFRL) Materials and Manufacturing Directorate has led to the development of an advanced computer software program that significantly reduces the time required to design sheet metal forming tools.

The Metal Forming Tool Design (MFTD) program, developed under a Department of Defense Small Business Innovation Research initiative, reduces product cycle time by more than 78 percent and decreases rejection rates by more than 90 percent. As a result of MFTD, trial-and-error design methodology is being eliminated and emphasis is rapidly shifting to building sheet metal parts and tools right the first time, helping lower production costs.

Tool design and fabrication can be extremely expensive and very time consuming. In the past, trial and error has been the commonly used approach. It was common for technicians to rework tools for complex forming operations four or five times to ensure they meet specifications. Often, the sheet metal tool was not optimal, meaning the tool had to be hand-worked following the forming operation. This additional effort may account for up to 40 percent of the total touch labor and it also leads to part variability.

This project developed an advanced computer software program which streamlines the design processes employed in sheet metal tooling. Used in conjunction with Metal Forming Simulation (MFS) software previously developed at the AFRL, MFTD helps eliminate trial-and-error, putting greater emphasis on designing parts and tools right the first time. The new software package achieves a substantial reduction in tool design time for sheet metal forming with the added benefits of improved accuracy and consistency in tool design. The tooling knowledge encapsulated and performed by the system enables companies to maximize their tooling staff and have grêater throughput.

MFS software permits designers to determine the formability of a given part prior to manufacturing. The entire software package has been demonstrated to reduce product cycle time by more than 78 percent while decreasing rejection rate by more than 90 percent. MFTD is embedded inside CATIA™ and AutoCAD™ computer programs which allows users to use the software without leaving their computer assisted design (CAD) environment. Other CAD environments, based on the ACIS engine, can seamlessly exchange CAD data. The MFTD software operates on Windows 95 and NT, as well as UNIX workstations such as IBM's RS/6000 and Silicon Graphics.

The program incorporated technologies developed under the Automated Tooling Manufacture for Composite Structures program, modified for use in the metal forming domain. The end result of this effort has been a marked increase in product quality and a significant decrease in production cycle times and rejection rates as well as wide spread applications potential in the commercial marketplace. To date, MFTD has proven to be highly successful wherever it has been applied. Continued application of MFTD and MFS computer software and related technologies could result in further improvements in product quality as well as important expanded applications in the private sector.

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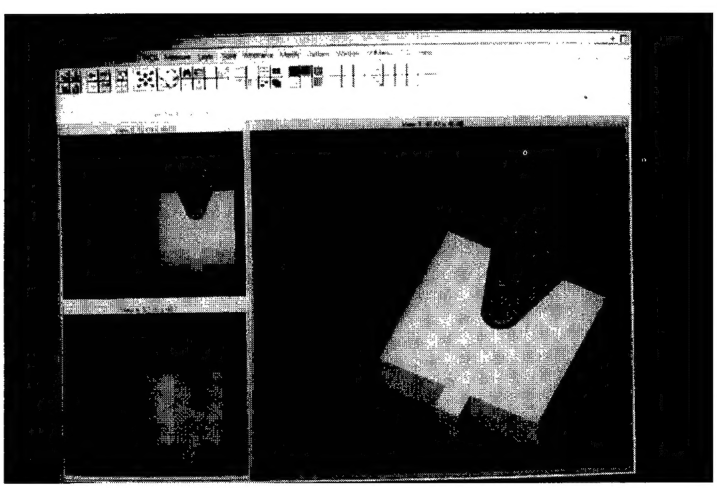
For more information, circle Reader Response Number 4


Example of Metal Forming Tool Design on computer monitor.

Integrated Product-Process Design System Improves Simulations-Based Design Capability

Scientists and engineers at Air Force Research Laboratory's (AFRL) Materials and Manufacturing Directorate and TechnoSoft, Inc., have developed an advanced computer-aided design program for improving airframe design processes.

The advanced software program is called The Adaptive Modeling Language™ and offers the benefit of an efficient and user friendly environment in which to develop high quality product and process designs. The program could save millions of dollars by reducing trial and error production to test conceptual engineering designs.

In the past, computer demonstrations involving feed-forward and feed-back design between conceptual and detail (materials and process) design have been accomplished with dated and oversimplified parametric models for cost and weight, or with models which are costing a component with little or no ability to represent and/or simulate the material and/or processing costs. These model-based costing approaches are inadequate by today's standards and often dated by evolving technology advancements.

AFRL scientists and engineers, working with researchers from Case Western Reserve University and the University of Cincinnati, embarked on an in-house research project to enable a feature-based, product-process design capability. The Adaptive Modeling Language (AML™) evolved as a result of further development by TechnoSoft, Inc. AML is an object-based modeling language for integrated product and/or process design, analysis and simulation, that facilitates *adaptive modeling* by enabling "object-coupling" between user defined shapes, features and material processes. These processes and their associated knowledge incorporate constraints such as costs or weight to create optimal results in an interactive design environment.

AML is not a legacy system with technology upgrades; it is a compact computer-aided design (CAD) system that enables free-form, parametric, constraint-driven, feature-based design and incorporates a non-manifold solid-, surface-, and wireframe-modeling capability. AML knowledge-based architecture has proven to be beneficial for modeling just about any physical system from complex mechanical-optical systems to cardiovascular blood flow. Lockheed Martin has partnered with TechnoSoft to use AML as the underlying framework for integrated mechanical and optical design. The result has been an interactive gimbal design system for aircraft threat and detection systems, affecting a 10-fold reduction in design cycles. TechnoSoft has also developed a "tow placement and ply design" system with the Boeing Company to automate process design of polymer-based laminate composites with dramatic savings projected. Ford Motor Company's initial application has been in the climate control area where AML has been used to design and deploy an "Interior Climate/ Comfort Engineering" (ICCE) system to improve customer satisfaction, climate control system robustness and reduce vehicle development costs. In the first year of implementation, ICCE reduced the company's vehicle development department's operating budget by more than 10 percent. Crankshaft, axle, hose routing, and suspension and steering systems are being looked at with growing interest by first-tier suppliers considering AML for designing power train components, manifolds and muffler systems.

AML has enabled an improved understanding of what is needed in an integrated conceptual design environment and has helped identify the associated database requirements. Ongoing use and evaluation of AML demonstrates it's diverse potential as an effective way of improving product and process design. Continued successful transfer of this technology to commercial industry could lead to dramatic advances, across a wide spectrum, benefiting both the nation's economy and quality of life.

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For more information, circle Reader Response Number 5

Failure Analysis Studies Improve Casting Process for Munition Components

A concerted research effort undertaken to improve the strength properties of cast aluminum forward housing assemblies for guided munitions may improve the production quality of similarly produced components on other type weapons systems while reducing the costs.

The forward housing assembly of a guided munition is a geometrically complex component that plays a critical role in the system's aerodynamic structure. In the case of the EMD-2 Joint Directed Attack Munition (JDAM), the manufacturer concluded that the repeated trial-and-error design of the casting process and modification of the part dimensions had not produced the mechanical properties required throughout the casting. The result was a major delay in the delivery schedule and quality of assured parts.

At the request of the manufacturer, the Boeing Company, research scientists and engineers in the Air Force Research Laboratory Materials and Manufacturing Directorate entered into a collaborative research effort with Texton, Inc., of Valencia, Calif., Crown Pattern and Foundry of Alahambra, Calif., Universal Energy Systems, Inc., of Dayton, Ohio, and Boeing, to examine the problem. Researchers performed systematic failure analysis studies, process simulations, nondestructive evaluations, metallurgical examinations and mechanical tests. Mechanical tests performed on both thick and thin sections of the forward housing assembly revealed that the tensile properties were well below the allowable design values. Nondestructive evaluations, such as radiology (X-ray analysis) and computed tomography (CT) were performed to determine the presence of gross shrink defects. The results of both the radiology and CT evaluations revealed no casting defects. However, after sectioning the part, visual examination revealed porosity uniformly distributed throughout the casting on the order of .1 millimeter pore diameter; again, with no causal link to gross shrinkage. Scanning electronic microscopy revealed elongated pores which indicated turbulent filling of the mold as opposed to improper degassing of the melt, which would have produced spherical pores. Based on these findings, the EMD-2 research group recommended that the manufacturer analyze and redesign the gating system in order to eliminate the turbulent flow problem during the permanent mold casting process.

These failure analysis studies show that porosity resulting from turbulent flow in the design mold can be corrected by redesigning the gating system. They also demonstrate that a more effective concurrent design engineering approach can reduce and help eliminate the occurrence of turbulent flow problems, saving potentially millions of manufacturing dollars through enhanced parts production quality and fewer delivery schedule delays. The results may also have important, long-term implications positively impacting Air Force sustainability and affordability requirements for many future systems.

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F33615-95-C-5822

For more information, circle Reader Response Number 6

Software Program Improves Quality of Carbon Rods Used to Build Aerospace Materials

Engineers and scientists at the Air Force Research Laboratory Materials and Manufacturing Directorate, working with researchers at Northwestern University, have successfully developed and transferred an advanced computer software program which dramatically improves the manufacturing process for carbon rods used to build advanced materials for aerospace systems.

The InfoScribe™ software program eliminates many of the drawbacks associated with conventional materials processing systems while increasing product reliability and affordability.

Manufacturing processes, particularly those used to build advanced materials for today's aerospace systems, need to be precisely controlled in order to optimize product quality and keep costs in line. One way of accomplishing this is through the application of new, advanced software programs that enable operators to exert greater control over the manufacturing process. This project successfully developed and transferred a highly advanced information system which gave better control over the process used to produce carbon rods.

Developed by research scientists in the Directorate's Materials Process Design Branch, InfoScribe™ is an advanced data acquisition, display, control and archiving program which permits the operator to display and use process data in real time. Its development eliminated many of the drawbacks associated with conventional materials processing systems. InfoScribe™ software's modular design allows for the processing of higher quality and more affordable materials, and provides flexibility in system design while avoiding the necessity of having to develop a completely new system for every materials process. These improvements assist both government and industry in reducing costs, system development time and production time for various material processes.

Installation of the InfoScribe™ software involves a modular system that includes a centralized data source, called a datalogger, and archived data files which work together to provide greater control over the process and thereby improve the quality of the carbon rods. One inherent advantage is that independent modules can be added or exchanged (depending on the particular application) with no effect on InfoScribe™ or other system modules. In short, no modifications are necessary to the InfoScribe™ code when changes are made in the system set-up. The InfoScribe™ modules provided to Northwestern University encompass data acquisition, process control, post-process data analysis and conversion of data to multiple external analysis formats. These critical program elements allow the software user to precisely measure line speed, the x and y axis on each carbon rod, and their lengths to ensure all of the customer's requirements are met. The program can also alert operators when something is wrong in the production line and perform the procedures necessary to shut down the line, resulting in a high quality manufacturing process at a reduced cost.

Increased control over the production of carbon rods for the purpose of building advanced aerospace materials improves both product reliability and affordability. The transfer of the InfoScribe™ software program to the private sector also demonstrates the effectiveness of process control technology and supports a long-term objective of extending existing control theory in order to enable an intelligent processing system to autonomously generate appropriate control paths that are tailored to the changing state of the material.

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For more information, circle Reader Response Number 7

Materials Research Scientist Honored by Professional Societies

A materials research scientist at Air Force Research Laboratory's Materials and Manufacturing Directorate has been elected a Fellow of the Society of Manufacturing Engineers (SME) and ASM International (The Materials Information Society).

Dr. James C. Malas, a senior researcher in the Directorate's Materials Process Design Branch, was recognized by both organizations for numerous outstanding technical achievements supporting both operational and future Air Force systems, and his expertise in transferring innovative materials processing technologies to commercial industry which have significantly improved productivity and reduced manufacturing costs.

Dr. Malas earned his B.S. in Materials Science and Engineering (1980) and M.S. in Systems Engineering (1985) from Wright State University, and Ph.D. in Engineering (1991) from Ohio University. He joined the Materials and Manufacturing Directorate as a co-op student in 1978 and studied microstructure-processing relationships for titanium alloys. After receiving his four-year degree, he worked as a materials engineer in the Directorate's Metals and Ceramics Division. His primary responsibilities were to help plan, organize and implement both the in-house and contractual processing science programs. These programs significantly advanced the basic understanding of material behavior under processing conditions and pioneered the development of numerical simulation capabilities for hot metal deformation processes.

In 1991, Dr. Malas transferred to the Materials Process Design Branch of the Integration and Operations Division, where he is the technical leader of an in-house team of six scientists and engineers involved in developing improved methods for designing and controlling various manufacturing processes, especially for aerospace materials and processes. His research contributions include new computer simulation models of material deformation processes, new material behavior relationships for describing processing behavior of titanium, nickel, aluminum and intermetallic alloys and their composites, and new process design and control methods for forging, extrusion and rolling processes.

Dr. Malas has authored more than 80 technical papers in prestigious journals and books, and has earned two patents. He has also organized 15 international symposia and conferences and has delivered more than 76 presentations at technical conferences, symposia and special workshops. In addition, he has been very active in professional organizations and community activities. He is an elected member of the North American Manufacturing Research Institution. He serves on the International Board of Review for the Journal of Materials Engineering and Performance (JMEP) and is a member of The Metallurgical Society and an editorial advisor for the Journal of Metals (JOM).

For more than 10 years, Dr. Malas has mentored junior employees and guided many undergraduate, master and doctoral students through their research projects. He is actively involved with the Air Force Research Laboratory's educational outreach programs and serves on the Advisory Board of Ohio University's Mechanical Engineering Department. Dr. Malas is also an adjunct professor of Materials Engineering at Wright State University. He has received several major awards in recognition of his leadership and technical contributions including the Materials and Manufacturing Directorate's Schwartz Engineering Achievement Award for Outstanding Materials Engineer (1993), the Federal Laboratory Consortium Award for Excellence in Technology Transfer (1994), the Air Force Association's Outstanding Civilian Manager at Wright-Patterson AFB Award (1995), and the Dayton Foundation's Affiliate Societies Council Award for Outstanding Research Engineer (1997). He has also received letters of citation from both the Secretary of the Air Force and the Secretary of Defense.

Dr. Malas was elected Fellow of the Society of Manufacturing Engineers (SME) and ASM International for outstanding contributions to the social, technological and educational aspects of the materials and manufacturing professions. Only two percent of ASM International's 50,000 members receives the honor of Fellow. Only one-half of one percent of SME's 68,000 members have been elected to that grade.

Materials and Manufacturing Directorate Hosts 1998 Roadmap Review

More than 400 leaders from industry, government and academia gathered at the Dayton Convention Center July 14-16, to participate in the Air Force Research Laboratory Materials and Manufacturing Directorate (ML) 1998 Roadmap Review.

ML's Acting Director, Dr. Charles Browning, hosted the event, giving a complete overview of the Directorate, reporting on recent organizational changes and discussing the Directorate's mission to help industry maintain an affordable defense materials and manufacturing capability.

Discussions included sessions on sustainment, nondestructive evaluation, airbase and environmental technologies, and ceramics and metallic materials. Other sessions covered carbon-carbon, nonmetallic, nonstructural, electronic and electromagnetic materials, and manufacturing technology related discussions. All three days featured breakout workshops offering participants an opportunity to learn more about specific technology areas being pursued by ML researchers.

Over 190 people attended the ManTech Luncheon, where Dr. Helmut Hellwig, Deputy Assistant Secretary for Science, Technology and Engineering, Office of the Assistant Secretary of the Air Force for Acquisition, gave a perspective on the Air Force ManTech program.

Attendance at this year's Roadmap Review was up, and the Directorate's Executive Group felt the event went extremely well. The annual review provides insight into planned Air Force materials and manufacturing research and development activities. It also provides an opportunity for participants to offer suggestions and ideas on future directorate research and development efforts.

To learn more about the Materials and Manufacturing Directorate, visit their website at: www.afrl.af.mil

Manufacturing Community Gears Up for DMC '98

Representatives from the government, academia, and industry are currently preparing for the 1998 Defense Manufacturing Conference, scheduled for November 30 through December 3, at the New Orleans Marriott Hotel, New Orleans, La.

The conference is a forum for presenting and discussing initiatives aimed at addressing defense manufacturing and sustainment needs. Hosted by the Joint Defense Manufacturing Technology Panel (JDMTP), DMC '98 will also provide participants with detailed technical discussions relating to the various initiatives and technology thrusts currently being pursued.

This year's conference is based on the theme, "ManTech for Affordable Readiness and Modernization," and will present the status of both government and industry programs as well as a vision for future needs. Much of the conference will be centered around technical sessions and mini-symposiums addressing a variety of topics.

The Manufacturing Technology Division (ManTech) of the Air Force Research Laboratory hosted more than 830 people at last year's DMC, which took place in Palm Springs, Calif. The Assistant to the Secretary of the Air Force (Acquisition), Arthur L. Money, was the Air Force keynote speaker for the event. Other general session speakers included acting Deputy Under Secretary of Defense (Logistics), Roy R. Willis; the Navy Acquisition Reform Executive, Daniel Porter; Dale Adams, Office of the Secretary of the Army (Research, Development and Acquisition); and Donna Richbourg, Acting Deputy Under Secretary of Defense for Acquisition Reform. Seventy five government and industry exhibits were on display for the duration of the conference.

For more info, contact the DMC' 98 exhibit manager at Universal Technology Corporation, (937) 426-2808, or visit the DoD ManTech Website at http://mantech.iitri.com/

Not the Last Issue of Manufacturing Technology Program Status Report

In a previous issue of this publication, it was announced that the Materials Technology Highlights and the Manufacturing Technology Program Status Report would be combined, in the interest of serving both audiences in the most efficient and economical manner. This was in error. The two will continue to be printed as separate publications.

Commercial Modules Built for F-22, Comanche Reduce Acquistion Costs More Than 50 Percent

By Mary Kinsella
Air Force Research Laboratory
Materials and Manufacturing Directorate

Representatives from the Air Force, Army, and industry met at the TRW automotive electronics manufacturing plant in Marshall, IL recently, to witness the manufacture of commercial modules which will be used for F-22 and Comanche systems. The meeting was the final executive review of the "Military Products from Commercial Lines (MCPL)" program managed by the Air Force Research Laboratory (AFRL) Materials and Manufacturing Directorate here.

MPCL is demonstrating that military modules can be redesigned for commercial manufacture using commercially available components, thus reducing acquisition costs by more than 50 percent.

This demonstration includes processing small volume, complex military modules among larger volumes of commercial products using computer integrated manufacturing and existing commercial production processes and equipment. The program also takes business practices into consideration by demonstrating how requirements can be defined without relying on MIL specifications and standards and providing a model subcontract for commercial suppliers.

Data has shown that commercial components meet military requirements in reliability and durability for these applications. The demonstration modules are the same form, fit, and function as their more expensive military counterparts. Further benefits in weight reduction occur due to the use of plastic component packaging in lieu of ceramic packages required by MIL specifications.

By using commercial suppliers, the defense industrial base is expanded, and more high quality, high efficiency manufacturers are available, especially in electronics. It has been the intent of MPCL to show that the DoD can benefit by leveraging commercial manufacturers and to capture and transfer the process of doing so. Although significant cultural resistance still exists, the mechanisms for building military products on commercial lines are beginning to fall into place.

The MPCL program is in its third and final phase in which production validation modules are being produced and will be transferred to the F-22 and Comanche program offices for use in their development systems. The two demonstration modules are digital communication, navigation, and identification modules known as the pulse narrowband processor, and the radio frequency front end controller. Following the success of the MPCL program, production modules are planned to be built using the demonstrated concepts. Significant cost avoidance is possible by leveraging existing high quality commercial manufacturing processes and equipment and by using commercially available components.

The MPCL program has broken down many barriers to building military products on commercial lines, has demonstrated key concepts of Acquisition Reform, and has provided much needed data in related business practices, manufacturing infrastructure, and process technology. Through its success, the program has received wide visibility, and was briefed to former Secretary of Defense, William Perry.

The executive review included a tour of the TRW automotive electronics manufacturing line during manufacture of MPCL demonstration modules. Attendees included representatives from the AFRL Manufacturing Technology Division, F-22 System Program Office, Comanche Program Management Office, TRW Avionics Systems Division, TRW Automotive Electronics, Lockheed Martin Aeronautical Systems, and others.

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Contract Number:
F33615-93-C-4335

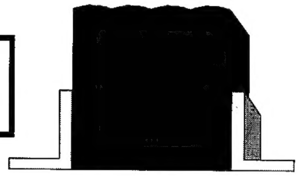
For more information, circle Reader Response Number 8

End of Contract Forecast

DATE	PROJECT TITLE CONTRACT NO.	PRIME CONTRACTOR	POINT OF CONTACT
October 1998	A Responsive Process Planning System in Agile Manufacturing Contract No.: Numerous	University of Missouri at Rolla Rolla, MO	David Judson (937) 255-7371
October 1998	Moisture Detection in Honeycombs via Advanced Radioscopy (High Resolution Real Radioscopy (HRRTR)) F33615-91-C-5623	Lockheed Martin Corporation, Missiles & Space Division Palo Alto, CA	Deborah Kennedy (937) 255-3612
October 1998	Mobile Automated Scanner (MAUS) F33615-91-C-5664	Boeing Company, Aerospace Division St Louis, MO	Deborah Kennedy (937) 255-3612
October 1998	Laser Cleaning & Coatings Removal (LCCR) F33615-95-C-5515	F2 Associates Incorporated Albuquerque, NM	Steve Fairchild (937) 255-8786
October 1998	Infrared Focal Plane Array/Flexible Manufacturing F33615-93-C-4320	Texas Instruments Incorporated, Central Research Laboratories Dallas, TX	P Michael Price (937) 255-2461
October 1998	Development of a Low Cost Environmentally Benign All-Sputtered Fabrication of Thin Film Transistors (TFTs) for Active Matrix Liquid Crystal Displays (AMLCD) F33615-94-C-4446	Intevac Incorporated Santa Clara, CA	Charles Wagner (937) 255-2461
October 1998	Development of Co-Optimized Rapid Thermal Process (RTP) and a Silicon Deposition Statistical Process Control (SPC) Process for Cost Reduced LCD Manufacturing F33615-94-C-4449	Intevac Incorporated, Rapid Thermal Processing Systems Rocklin, CA	Charles Wagner (937) 255-2461
October 1998	Military Products from Commercial Lines F33615-93-C-4335	TRW Incorporated, Avionics Systems Division San Diego, CA	Mary Kinsella (937) 255-2461
November 1998	Hand Held High Resolution Imaging Device for Aircraft F33615-97-C-5158	Eikos LLC Raynham, MA	Vincent Johnson (937) 255-7277
November 1998	E-3 Airborne Warning & Control System (AWACS) Synchronizer Remanufacture Using VHDL F33615-97-C-5140	Northrop Grumman Corporation, Electronic Sensors and Systems Baltimore, MD	William Russell (937) 255-7371
November 1998	Advanced Modular Factory Program F33615-96-2-5113	Raytheon Company, Missiles Systems Division Tucson, AZ	Brench Boden (937) 255-4623
November 1998	Integrated Product & Process Development (IPPD) Tools F33615-96-C-5605	Dayton Aerospace Associates Incorporated Beavercreek, OH	George Orzel (937) 255-4623
November 1998	Novel Low Cost Thermosets for Advanced Aerospace Composites F33615-96-C-5628	Aspen Systems Incorporated Marlborough, MA	Vincent Johnson (937) 255-7277

DATE	PROJECT TITLE CONTRACT NO.	PRIME CONTRACTOR	POINT OF CONTACT
November 1998	National Industrial Information Infrastructure Protocols (NIIIP) F33615-94-2-4447	International Business Machines Corporation Stamford, CT	Theodore Finnessy (937) 255-4623
December 1998	Intelligent Processing of Materials for Chemical Vapor Infiltration F33615-96-C-5839	Technology Assessment & Transfer Incorporated Annapolis, MD	Claudia Kropas-Hughes (937) 255-8787
December 1998	Electric Component Commerce F33615-96-2-5116	Digital Market Sunnyvale, CA	William Russell (937) 255-7371
December 1998	Flat Panel Displays Contract No.: Multiple	Dpix Incorporated Palo Alto, CA	John Blevins (937) 255-3701
December 1998	Electronic Component Information Exchange F33615-97-2-5121	Silicon Integration Initiative Austin, TX	William Russell (937) 255-7371
December 1998	Self Orienting Fluidic Transport (SOFT) Assembly F33615-96-C-5111	Beckman Display Incorporated Berkley, CA	Charles Wagner (937) 255-2461
December 1998	Internal Real-Time Distributed Object Management System F33615-96-C-5112	Systran Corporation Dayton, OH	David Judson (937) 255-7371
December 1998	Mixed Signal Test (MiST) F33615-95-2-5562	Boeing Company Seattle, WA	William Russell (937) 255-7371
December 1998	Joint Strike Fighter (JSF) Technology Manufacturing Demonstrations F33615-95-C-5529	Hughes Company, Aircraft Division Los Angeles, CA	Alan Herner (937) 255-9245
December 1998	New England Supplier Institute (NESI) F33615-94-2-4424	Corporation for Business, Work, & Learning, Center for Applied Technology Boston, MA	Wallace Patterson (937) 255-4623
January 1999	Electronics CAD-CAM Exchange (ECCE) F33615-96-C-5118	Intermetrics Incorporated McLean, VA	William Russell (937) 255-7371
January 1999	Instrument for Rapid Quantitative and Nondestructive Wafer Evaluation F33615-96-C-5108	Sentec Corporation Walled Lake, MI	Walt Spaulding (937) 255-2416
January 1999	Continuous Electronics ENhancements Using Simulatable Specifications (CEENSS) F33615-93-C-4304	TRW Incorporated Beavercreek, OH	Alan Winn (937) 255-4623
February 1999	Manufacturing Technology for Multi-Bandgap Solar Cells F33615-95-C-5561	Spectrolab Incorporated Sylmar, CA	P Michael Price (937) 255-2461

Reports



Decision Support System for the Management of Agile Manufacturing

Alog Number: 4110
Contract Number: F33615-95-2-5525
Technical Report Number: AFRL-ML-WP-TR-1998-4004
Accession Number: N/A
Distribution: LIMITED

Electronics Sector End-to-End Pathfinder

Alog Number: 3937
Contract Number: F33615-94-C-4431
Technical Report Number: WL-TR-96-8033
Accession Number: ADB222216
Distribution: LIMITED

Tertiary Recycling of Electronic Materials

Alog Number: 4135
Contract Number: F33615-95-C-5507
Technical Report Number: WL-TR-97-4133
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Design and Manufacture of Low Cost Composites (DMLCC), Wing

Alog Number: 4114
Contract Number: F33615-91-C-5720
Technical Report Number: AFRL-ML-WP-TR-1998-4014
Accession Number: N/A
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Smart Electron Cyclotron Resonance (ECR) Plasma Etching

Alog Number: 4121
Contract Number: F33615-92-C-5972
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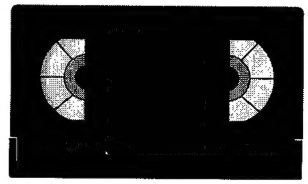

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Fall 1998

The USAF Manufacturing Technology

PROGRAM STATUS REPORT

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